REMARKS

The remainder of this Amendment is set forth under appropriate subheadings for the convenience of the Examiner.

Amendments to the Claims

Claim 9 has been amended to more clearly define the claimed invention by reciting "estimates of the physical properties are dynamically calculated based on the instantaneous physical property values for a given time provided by the rigorous steady state modeling." Support for this amendment can be found in the specification, for example, at page 4, lines 8-13, page 6, lines 21-25 and page 7, lines 5-11. Claim 16 has been amended to more clearly define the claimed invention and recite "the steady-state modeler providing a steady state model of the subject process, including values of physical properties at steady state" and "a dynamic model of the subject process is formed from the steady state model, including the values of physical properties at steady state." Support for this amendment can be found in the specification, for example, at page 4, lines 8-13, page 6, lines 21-25, page 7, lines 5-11 and page 12, lines 13-20.

New Claims 21 and 22 that are identical to originally filed Claims 19 and 20, respectively, have been added.

No new matter has been added.

Allowable Subject Matter

Claims 19 and 20 have been objected to as being dependent upon a rejected base claim. However, the Examiner states that Claims 19 and 20 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As discussed above, new Claims 21 and 22 that are identical to originally filed Claims 19 and 20, respectively, have been added. Independent Claim 21 includes all the limitations of originally filed Claim 16 and Claim 19. Claim 22 depends from Claim 21. Applicants believe that these new Claims 21 and 22 are allowable based on the Examiner's statement of Allowable Subject Matter. Acceptance is respectfully requested.

Rejection of Claims 1-20 under 35 U.S.C. § 103(a)

Claims 1-20 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,402,333 to Cardner (hereinafter "Cardner").

A. Regarding Claims 1-8

Applicants' invention claimed in Claims 1-8 relates to a computer apparatus comprising ***a steady state modeling means*** for rigorously modeling a chemical process at steady state and ***an inferential model means*** coupled to receive values of physical properties of the process at steady state from the steady state modeling means, where the inferential model means ***determines state of the physical properties over a period of time based on the values of the physical properties at steady state.*** As discussed at page 2, line 13 through page 3, line 3 in the specification, Applicants' invention employs two different conventional methods coupled to each other for developing estimates of product properties, namely a regression-based inferential method and a State Estimation Model method. The inferential method is based on ***data regression***, and the State Estimation Model method is based on ***mass and energy balance equations***. In particular, Applicant's invention utilizes a ***steady state*** estimation model. The inferential method of the invention can integrate in real time the data at steady state provided by the steady state estimation model means to provide timely information, e.g., cumulative properties, ***dynamically through data regression***.

Cardner discloses a system comprising a process model ***based on energy and material balance relationships*** (see, for example, Column 7, lines 62 through Column 8, line 23). Cardner also discusses various assorted techniques such as alignment, calibration of model, calibration of model output quality estimates, an alignment controller, a statistical filter, etc., for ***minimizing the error between measured and calculated stream composition/product properties*** by ***determining the error*** and ***making adjustments*** to model parameters, model input and output signals (see, for example, Column 10, lines 35-38). However, there is no disclosure in Cardner of ***an inferential model means***, especially, ***coupled to a steady state modeling means*** for ***determining state of physical properties*** of a chemical process ***over a period time based on values*** of the physical properties ***at steady state*** from a steady state modeling means, as exists in the present invention.

As noted by the Examiner, Cardner discloses product property estimates coupled to receive values from a simulation model to produce a ***corrected*** product property, ***but not*** the

calculation of the state of product properties of a chemical process over a period of time from data at steady state:

> The filtered difference **403** is introduced into the product property corrector **402** along with the stream composition/product property estimates **117** from the simulation **110** to produce a ***corrected*** stream composition/product property estimate **401**. The product property corrector module **402** ***corrects*** the predicted product property signals **117** ***by application of the product property average error*** **403** according to the manner by which it was derived, ***to produce the corrected product property signals*** **401**, which in turn are used as input to the product property controllers **240** and by the flow data reconciliation module **108** (Column 13, lines 46-57, emphasis added).

The above techniques disclosed in Cardner are related to minimizing the error between measured values and computed values. In other words, Cardner is directed toward dynamic state estimate models coupled to the various techniques for determining prediction errors and ***rectifying*** a model's prediction. However, there is no disclosure or suggestion in Cardner of an inferential method for ***determining state of physical properties*** of a chemical process ***over a period of time*** from ***data at steady state*** as in the present invention. It should be noted that determining the error between measured and computed values or producing corrected product properties by making adjustments based on the errors are an entirely different concept than determining state of physical properties of a chemical process over a period of time from data at steady state.

In addition, although Cardner mentions steady state models, Cardner does not imply or suggest the conversion of values of physical properties of a chemical process at steady state provided by a steady state modeling means to dynamic product property estimates, e.g., by the use of an inferential model means, in contrast to the present invention. One of ordinary skill in the art could neither have known how to nor have been motivated to correlate the ***product properties at steady state*** to the ***dynamic product property estimates over a period of time*** based on the disclosures in Cardner, because Cardner ***merely mentions*** the case of steady state modeling means without further detailed discussion (see, for example, Column 6, lines 49-63).

The foregoing patentable limitations and distinctions over the prior art are recited in base Claim 1 with the language "... the inferential model means for determining state of the physical properties over a period of time based on values of the physical properties at steady state." Claims 2-8 are dependent from Claim 1, and thus, include the foregoing claim limitations and distinctions

over the prior art.

Therefore, the subject matter of Claims 1-8 is not obvious in view of Cardner, and meets the requirements of 35 U.S.C. § 103(a). Reconsideration and withdrawal of the rejection of Claims 1-8 are respectfully requested.

B. Regarding Claims 9-15

As amended, Applicants's Claims 9-15 are related to methods for determining state of physical properties of a chemical process comprising the step of estimating state of the physical properties over a period of time using a first order dynamics of mixing analysis, such that the estimates of the physical properties are ***dynamically calculated based on the instantaneous physical property values for a given time*** provided by a rigorous steady state modeling.

Cardner does not imply or suggest estimating the state of the physical properties of a process over a period of time, such that the estimates are dynamically calculated based on the instantaneous physical property values for a given time provided by a rigorous steady state modeling, as in the present invention. Since Cardner does not disclose directly Applicants' claimed invention of Claim 9, the Examiner resorts to Column 13, lines 46-57 in Cardner to support the rejection of Claim 9 as being obvious. However, as discussed above, Cardner mainly discloses how to determine and minimize prediction errors (see, for example, Abstract, Column 10, lines 18-38 and Column 13, lines 46-57). As stated previously, determining the error between measured and computed values and producing corrected product properties by making adjustments based on the errors are an entirely different concept than determining state of physical properties of a chemical process over a period time from data at steady state. Therefore, one of ordinary skill in the art using Cardner would neither have known how to nor have been motivated to ***estimate dynamically*** state of physical properties of a chemical process ***over a period of time using instantaneous physical property values*** of the process ***for a given time*** provided by a rigorous steady state modeling.

As amended, base Claim 9 recites the foregoing patentable distinction over the prior art with the language "using the instantaneous physical property values, estimating state of the physical properties over a period of time ..., such that estimates of the physical properties are dynamically calculated based on the instantaneous physical property values for a given time provided by the rigorous steady state modeling." Claims 10-15 depend from base Claim 9, and

thus, include this claim limitation.

Accordingly, the subject matter of Claim 9 and Claims 10-15 dependent from Claim 9 is not obvious in view of Cardner, and meets the requirements of 35 U.S.C. § 103(a). Reconsideration and withdrawal of the rejection are respectfully requested.

C. Regarding Claims 16-20

As amended, Applicants' invention claimed in Claims 16-20 is directed to a computer apparatus for process control, comprising a steady state modeler, an inferential sensing member coupled to the steady state modeler and a network communication assembly. The inferential sensing member determines state of physical properties over a period of time such that ***a dynamic model of the subject process is formed from the steady state model***, including the values of physical properties at steady state and further provides parameter values for maintaining physical properties at a user specified state in the subject process to effect control of the process.

As discussed above, there is no disclosure or suggestion in Cardner of an inferential sensing member. There also is no disclosure or suggestion in Cardner of a computer apparatus for process control comprising the inferential sensing member coupled to a steady state modeler, as in the claimed invention.

Because there is no disclosure in Cardner of the claimed invention of Claim 16, the Examiner resorts to Column 13, lines 46-57 in Cardner, stating that "a model [for] to perform estimates of the physical properties similar to the product property estimates 117 of Cardner in order to determine the state of the physical properties over a period of time based on the physical properties produce[s]d by the model 110 at steady state." However, the disclosure at Column 13, lines 46-57 in Cardner relates .to techniques for determining the error between measured and computed values and minimizing the variance of estimation errors by making adjustments to current state of a model. As stated previously, determining the error between measured and computed values and producing corrected product properties by making adjustments based on the errors are an entirely different concept than determining state of physical properties of a chemical process over a period time from data at steady state.

Thus, there is no disclosure or suggestion in Cardner of forming "...a dynamic model of the subject process ... from the steady state model," as set forth in base Claim 16. Further, in contrast to the present invention, there is no disclosure or suggestion in Cardner of an inferential

sensing member "for determining state of physical properties over a period of time, such that a dynamic model of the subject process is formed from the steady state model, including the values of physical properties at steady state." Furthermore, there is no disclosure or suggestion in Cardner of the inferential sensing member "...further providing parameter values for maintaining the physical properties at a user specified state in the subject process to effect control of the process," as claimed in base Claim 16. Since there is no disclosure or suggestion in Cardner of these claimed limitations, the claimed invention would not have been made obvious to one of ordinary skill in the art in view of Cardner.

Claims 17-20 depend from base Claim 16, and thus, include the foregoing claim limitations and distinctions over the prior art.

Accordingly, the subject matter of Claims 16-20 is believed to meet the requirements of 35 U.S.C. § 103(a). Reconsideration and withdrawal of the rejection are respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims (Claims 1-22) are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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